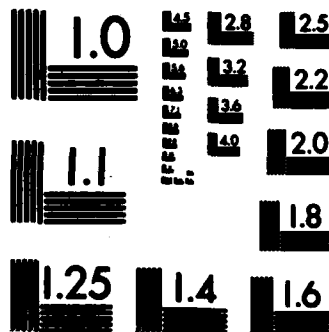MICROCOPY RESOLUTION TEST CHART
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From: Commandant of the Marine Corps
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Subj: REQUIRED OPERATIONAL CAPABILITY (ROC) NO. TNG 1.04a FOR
         PRODUCT IMPROVEMENT OF THE TACTICAL WARFARE SIMULATION,
         EVALUATION AND ANALYSIS SYSTEM (TWSEAS)

Ref: (a) MCO 3900.4B

Encl: (1) ROC No. TNG 1.04a for Product Improvement of the
             Tactical Warfare Simulation, Evaluation and Analysis
             System (TWSEAS)

1. In accordance with the procedures set forth in the reference,
ROC TNG 1.04a for Product Improvement of the Tactical Warfare
Simulation, Evaluation and Analysis System (TWSEAS), is hereby
established and promulgated.

2. The Commanding General, Marine Corps Development and
Education Command (Director, Development Center) is the Marine
Corps point of contact for any questions pertaining to this ROC
and any development efforts pertaining thereto.

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Ray M. FRANKLIN
BRIGADIER GENERAL, U.S. MARINE CORPS
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REQUIRED OPERATIONAL CAPABILITY (ROC)
FOR
PRODUCT IMPROVEMENT OF THE
TACTICAL WARFARE SIMULATION, EVALUATION,
AND ANALYSIS SYSTEMS (TWSEAS)

1. STATEMENT OF THE REQUIREMENT

a. There is a requirement for an improvement in the capability to conduct computer-assisted tactical exercises in support of Marine Corps amphibious training programs. Computer assistance is provided by the Tactical Warfare Simulation, Evaluation, and Analysis Systems (TWSEAS). TWSEAS currently consists of two software programs and three operational sites. The fielded systems are well proven and highly utilized. They do, however, contain only limited capabilities in several areas such as air operations, combat service support and terrain model resolution. Additionally, refinements in ground combat operations and detection, the capability to conduct multiple exercises and integrated field/command post exercises, and the ability to interface with selected Marine Tactical Automated Command and Control (MTACCS) systems are required. These product improvements will make the TWSEAS a more viable system for providing tactical decision making and staff procedural training to all Marine Air-Ground Task Force (MAGTF) staffs. Also, the capability of computer assisted command and control of the field portion of integrated exercises is enhanced with the required improvements.

b. The Integrated Maneuver Controller (IMC) software will provide the upgraded capabilities outlined in this ROC. Some interfaces, such as with the Digital Communications Terminal (DCT), will require TWSEAS hardware modifications.

c. These product improvements will be fielded in the current TWSEAS hardware with appropriate modifications. Usage will be as defined in the previously mentioned TWSEAS ROC. The addition of a suite of developmental hardware will be required. Upon completion of IMC, this equipment will form the basis of a fourth TWSEAS suite.

d. The mission of TWSEAS, both in its initial form and following the product improvement, is to assist in the *Command and Control* aspects of tactical exercises of all varieties and to train commanders and staffs in tactical decision making with primary orientation toward the MAGTF staff and the ground combat element. However, a product improvement as set forth in this ROC will significantly enhance the system's ability to exercise the air combat element (ACE) and combat service support element (CSSE) staffs in procedures and tactical decision making. The initial operational capability/full operational capability (IOC/FOC) for the IMC portion of this ROC will be late FY 86.

2. THREAT AND TRAINING DEFICIENCY

a. <u>Threat</u>. Marine Corps forces must be prepared to respond immediately and selectively to a wide variety of potential combat commitments. Combat training must be relevant to the demands of future combat operations. Threat forces continue to acquire more varied and extensive combat capabilities. Moreover, modern technology makes it possible for them to introduce new capabilities within a relatively short time. Consideration of the threat indicates that it will be increasingly difficult for the Marine Corps to provide adequate training for its combat forces.

b. <u>Training Deficiency</u>

(1)   Consideration of the Marine Corps' own forces makes it evident that severe training problems will be encountered.   Modern combat equipment, particularly the emerging MTACCS family, is increasingly sophisticated and complex, demanding more exacting skills to employ and maintain it effectively.   Moreover, new technology can have a pervasive impact on organization, procedures and methods.   Thus, it will be more difficult to train with equipment already in use and to adjust training to the changes that these systems will cause.

(2)   Tactical exercises have great importance and potential as a training and testing medium.   IMC and the other improvements will increase the viability of such exercises by allowing the commander's staff to use the new emerging MTACCS systems in a realistic, simulated combat environment.   MTACCS systems do not contain training features of sufficient complexity to allow for, or assist in a large scale, integrated exercise involving the commander and his staff.   By allowing the commander and his staff to use his actual command and control systems, IMC will continue to provide, as the earlier versions of TWSEAS currently do, the realistic, simulated combat situations which stimulate staff action.

(3)   Current TWSEAS systems are limited to assisting either a field exercise (FEX) or a command post exercise (CPX).   In an FEX, supporting arms units and some OPFOR units are often simulated.   In a CPX, battery/battalion fire direction centers, air command and control agencies may be real and the actual exercise staff are real.   In both modes, higher and adjacent units are normally simulated.   This mix of real and simulated units provides unique problems in exercise control.   The use of integrated software will alleviate this factor and will allow the tactical exercise support team (TACEX) to concentrate on other exercise issues.

(4)   While most of the MTACCS systems contain training simulation programs, these are primarily aimed at the operator and do not provide a flexible, training environment for the commander and his staff.   Moreover, many of the systems require other assets in order to provide combat information.   As an example, the Position Location Reporting System (PLRS)-requires a master station (MS) and a number of user units (UU) to function.   In a CPX, the units which would carry the UUs would be mostly simulated.   The ability of IMC to automatically enter position information into a PLRS MS from its data base of simulated units will permit the exercised staff to fully utilize that system without expending man power to position UUs in the field.   Conversly, the accurate reporting of actual unit locations in the FEX is essential to proper exercise C^2 operations.   The cabability of IMC to receive and automatically process PLRS information will provide this and ease the burden of an already busy umpire.

(5)   The current automated exercise control system lacks a flexible report generation system which is essential for meaningful evaluation and critique. Additionally, air-to-air, surface-to-air, communications/electronic warfare and most CSS functions are lacking.   A major deficiency of the system is the inability to conduct multiple exercises simultaneously.

(6)   Due to the limited number of TWSEAS sites and the diversity of locations with potential customers, a need exists to investigate further expansion of the remote exercise configuration.

2

(7) The consequences of these deficiencies are:

(a) Control of integrated exercises (i.e., containing real and simulated units) is awkward in the present TWSEAS and relies heavily on the expertise of the TACEX team.

(b) Exercise records and reports do not provide meaningful information for subsequent study and research to enhance individual learning or acquire new knowledge of the combat process.

(c) The training programs do not offer Marine officers in all organizations of the MAGTF adequate opportunities to develop their professional skills in tactical decision making and staff functioning..

(8) These deficiencies are already serious and will become even more pronounced in the future as the automated C^2 systems emerge.

3. OPERATIONAL AND ORGANIZATIONAL CONCEPTS

a. General

(1) The primary role of a TWSEAS is to simultaneously provide a realistic, simulated environment for CPX use in which procedural and decision making processes may be practiced by the commander and his staff and to support the command and control of FEXs. TWSEAS is required to interact with the C^2 systems in use during the exercise. These include both the tactical and exercise control systems. As the MTACCS era becomes a reality, TWSEAS will need to interoperate/interface with these systems. Such interfaces will be examined on a case by case basis to determine the optimal methods available. It is anticipated that automated, bi-directional interfaces with the DCT and PLRS will be the initial applications. MTACCS interfaces are required to provide a realistic battlefield environment for tactical decision making and staff functioning. Additionally, an automated interface to the artillery battery level computer, a non-MTACSS system, may also be effected.

(2) Employment of individual systems will be coordinated within a MCDEC/FMF training network. These commands will use the network to identify, develop, and communicate solutions to combat training requirements. Mutually supporting programs of computer-assisted tactical exercises will be conducted so that the benefits of computer assistance for individual exercises may be shared by all participating commands. The network will be used to exploit the full potential of these exercises as a medium for training and testing. MCDEC will devote its resources to developmental, training, and educational TWSEAS applications. Those applications will be available to the FMF's to enhance amphibious training programs. The FMF's through the conduct of these programs, will provide operational feed back required for the accomplishment of MCDEC's developmental and educational missions.

(3) Technical support is provided by team members (civilian) at the individual sites and by the logistic and software support activities of the TWSEAS network.

(4) Mutual support is provided to each team through the exchange of ideas, information, and procedures among teams.

b. **TWSEAS Employment in the FMF**

(1)   TWSEAS employment in the FMF will focus on training combat, combat support (CS) and CSS units. The system will be required to support tactical exercises for the Marine Amphibious Force (MAF), Marine Amphibious Brigade (MAB), and Marine Amphibious Unit (MAU). It will also be used to support the training of ground combat organizations at the battalion, regimental, and division levels. Support for aviation and CSS staff exercises will be possible at a lower level of detail. Both troop exercises and staff exercises will be supported as required for a balanced, diversified training program.

(2)   TWSEAS can support the execution of MCCRES evaluations by providing exercise control services and the recording of MPS scores. Future incorporation of MCCRES software capabilities should be considered.

(3)   TWSEAS will also be used to support research, development, test and evaluation (RDT&E) efforts by the Marine Corps Development and Education Command (MCDEC). With the inherent capability to modify the TWSEAS data base and input parameters, training exercises can be developed to assist in determining the effectiveness of current and proposed organizations, doctrine, tactics, and equipment. The use of TWSEAS in this role is a means to explore, test and experiment with new concepts and equipment. TWSEAS will provide controlled test conditions, such as replay capabilities and data computations, to produce information for analysis.

(4)   FMF unit commanders have a continuing requirement to test and rehearse contingency plans for actual combat operations. The TWSEAS combat simulation models can be applied to such plans to evaluate and refine proposed courses of action and to prepare assigned commanders and their staffs for their roles in executing the plans.

c. **TWSEAS Employment at MCDEC**

(1)   TWSEAS will be employed at MCDEC to develop and present a continuing series of tactical exercises as a major feature of the professional education of Marine Corps officers. These exercises will be conducted to provide students with opportunities for tactical decision making and problem solving in dynamic, simulated combat environments. Exercises will be tailored to the academic objectives and student level of the school concerned and will include both integrated problems and functional (structured) problems as required. TWSEAS will support the curricula of the Command and Staff College (C&SC), Amphibious Warfare School (AWS), Communications Officers School (COS) and other schools as designated. In this application, the TWSEAS is required to support up to four two-sided, free play exercises, utilizing separate data bases, terrain, and exercise times. Individual suspension/resumption of exercises is required; however, due to hardware configuration restraints, the execution of separate simultaneous exercises may preclude individual replay of more than one of the exercises.

(2)   Educational applications at MCDEC will be in the form of computer-assisted map maneuvers. These will include MAF and MAB exercises and other forms as required by particular schools. Instruction in functional areas that may require TWSEAS support will include intelligence, supporting arms, aviation employment, and logistics. There is potential for TWSEAS to support company level field exercises at The Basic School.

(3)   The TWSEAS system at MCDEC will constitute the required hardware for the TWSEAS software support activity at the TWSEAS Network headquarters.

d. Organizational Concepts

(1) The MCDEC, FMFPAC and FMFLANT individual TWSEAS will each be a resident, organic unit of its respective command. System employment, therefore, will be a command responsibility. The FMF's will conduct TWSEAS exercises to support their respective training programs. MCDEC will conduct TWSEAS exercises to support its educational and developmental programs. MCDEC will be the coordinating authority on matters of mutual support and interest to include the exercise of centralized control over software modifications.

(2) Each system will be manned and operated by a small unit designated as the Tactical Exercise Support Team (TACEX). The team will include Marine Officers to perform operational functions requisite to effective employment of the system and technical personnel for operation and maintenance of the system's hardware and software. The team will participate in tactical exercises selected for TWSEAS support. When so employed, it will function as an integral part of the exercise control headquarters, utilizing the system to establish and operate a computer-assisted Tactical Exercise Control Center (TECC). The team will be a permanent organization, remaining intact between exercise assignments in order to provide stability and continuity for future exercises.

e. Employment Locations. TWSEAS will be employed both in the field and in garrison, wherever the exercise control headquarters may be located for a particular exercise. It must be designed and configured to function under field conditions or aboard ship in the same environment as the units it supports. It must support exercises in any field training area used by FMF units. The system must also be readily adaptable to employments in garrison facilities for staff exercises that do not require the participants to go into the field.

f. Special Logistical Support Considerations

(1) Maintenance of TWSEAS hardware and software will demand skills that are not readily available within the Marine Corps. Initially, with only three systems deployed, TWSEAS will be a low density system. It will include unique software and some unique items of equipment. These characteristics, coupled with the projected frequency and intensity of TWSEAS employment in tactical exercises, create requirements for substantial organizational maintenance capabilities at the team level, reinforced by responsive centralized maintenance resources. Highly skilled technicians must be organic to each team and others available on call at the intermediate level.

(2) The TWSEAS represents a very small population density for logistic and depot level support and will require contractor sources for maintenance and related technical support that is not within existing Marine Corps' capabilities. Although every effort should be made to procure repair parts through Governmental supply sources, it should be noted that the TWSEAS has many unique components which can only be obtained from commercial sources. In addition, to ensure optimum readiness of the deployed TWSEAS unit, supply officers must be prepared to expedite requests from the TACEX Team Commander for the open purchase of repair parts. Because of its unique mix of commercial and tactical equipment, the TWSEAS should not be the subject of Marine Integrated Maintenance Management reporting.

g. Estimate of Quantities Required. The current TWSEAS network consists of three systems. A 4th system will be fielded upon the completion of the IMC software. The system is designated to support FMFPAC. Additional systems may be required for 29

Palms and/or USMCR applications.

4. ESSENTIAL CHARACTERISTICS

a. Equipment Characteristics

(1)   Each system will be housed in a minimum of two militarized shelters, the computer van and the maintenance van. Additional "operations" shelters will be required for FMF teams to house terminals used in the field environment, and to provide work space for the Tactical Exercise Control Group (TECG).

(2)   Each TWSEAS system will have, as a minimum, the following number and types of terminals:

(a)   Alphanumeric terminals - 8

(b)   Automated geographic displays - 8, 1/channel

(c)   Teletypes - KSR style - 8

(d)   High speed line printer - 1

(e)   Medium speed page printers - 8

(f)   Large screen geographic display - 1

(3)   Certain exercises will require that the TECG be established in a building. Others may require the use of tentage to supplement the working space available in the operations shelter. Equipment in the operations shelter must be readily relocatable to accommodate these requirements. Equipment in the computer shelter may be fixed in place as required by normal engineering practice. In view of the potential environments in which the TWSEAS will be employed and the extreme low density of the systems, the use of MIL-SPEC or ruggedized hardware is desired to the maximum extent practical. TWSEAS systems are to be ground, air and ship transportable. Air transportation capabilities will include C-130/C-141 aircraft.

(4)   TWSEAS will use the AN/UYK-7 Navy-Marine Corps standard tactical computer and the software will be written to take full advantage of its capabilities. This computer will have 224K of main storage with two central processor units (CPUs). The future replacement for the AN/UYK-7 is expected to be the AN/UYK-43 tactical computer, however, this does not preclude the possible use of alternative hardware sets of a non tactical nature should these prove practical and feasible.

(5)   As part of the TWSEAS product improvement, various hardware changes need to be developed.   An automatic, electronic interface between the TWSEAS hardware and both the DCT and PLRS is required. The next probable interface would be to the artillery battery level computer system. The hardware and software modifications required will be performed in TWSEAS rather than in the tactical systems.

(6)   Successful TWSEAS operations will depend on the establishment of reliable digital and voice communications nets, both doctrinal and exercise control.   The requirement for two-way digital communications supports the switch from the current one way Digital Message Entry Device to a two way net utilizing the DCT. DCT's and associated communications equipment should be organic to each TWSEAS system. The

DCT will be used in conjunction with standard tactical radio transceivers, such as the AN/PRC-77, for burst transmissions of digital message data. Data will be entered into the computing system through specially designed receiver terminals.

(7)   Because the using organization may either have limited communications assets or may have fully committed their resources to the exercise, the TWSEAS may be required to supply the communications equipment necessary to support the control function of the exercise. In addition to a minimum of four receiver/transmitters (one for each of the four DCT channels), the equipment organic to the TWSEAS must include field radios, switchboards, remote terminals, headsets, intercom devices and related items necessary to ensure maximum efficiency and effectiveness of the TECC as a communications facility. Included must be sufficient equipment to allow two-way digital communications at a distance of at least 60 nautical miles over two of the form DCT channels.

b. Major Software Functions

(1) General. The TWSEAS computer software is required to support the conduct of integrated field and command post exercises in a field environment. Additionally, it must support similar activities, including multiple, simultaneous exercises in the academic environment. Exercise play will include MAU, MAB and MAF levels. In supporting a tactical exercise, the TWSEAS will generate, process, store and display comprehensive data on both the actual and simulated operations of the opposing forces. On-line processing, in conjunction with a static and exercise data base, will be performed to provide controllers and players with continuously updated information, for centralized, real-time control of exercise play. The data will be stored for retrieval as needed during the exercise and for reconstructing exercise operations for post-exercise replay and evaluation.

(2) Information on actual operations will be derived primarily from empirical data originated by unit umpires and transmitted by high speed digital communications for entry into the computer system. Controllers will also have a requirement to enter data through their interactive consoles in the TECG. Information on simulated operations will be derived from data entered by controllers and from data generated by computer simulation routines.

(3) Exercise information will be displayed electronically for controllers in the TECG and also provided in hard-copy form. Such information will include the location, status, and activity of exercise units together with calculations of combat power, performance evaluations, casualty and damage assessments and other computations which will assist controllers in guiding the progress of exercise play. Controllers will sometimes interpret the TWSEAS computer outputs to provide feedback for the exercise units. Information output shall be in varying levels of detail ranging from precise for TEC personnel, to realistically generalized for player use. Input and output formats must be easily modifiable to conform to MTACCS standards and subsequent modifications thereto.

(a) In the field maneuver portion of an exercise, the TECG controllers will exercise control primarily through unit umpires. This will require that they transmit instructions and information to the umpires, who, in turn, will provide the necessary feedback to the exercise units. Direct two way digital communications between controllers and selected exercise units will also be used for this purpose.

(b) In the simulated portion, controllers will provide feedback directly to

7

the player staffs by playing the roles of simulated units. In the MTACCS era, the TWSEAS will provide appropriate information on simulated units to the MTACCS systems. Providing the position location information (PLI) of simulated units for a real PLRS system is the most fundamental and near term requirement.

(4)   Fast system response time is essential.   System input and acknowledgements will occur in a maximum of 5 seconds. Execution of the command will start on the next cycle of the appropriate module, but in no case will this be longer than 90 seconds.

(5)   For post-exercise evaluation purposes, TWSEAS will be required to replay, exactly, any or all desired portions of exercise operations, simulated as well as actual, for detailed study.   The system must reconstruct and display exercise operations electronically so that a commander may analyze the performance of his unit within the total combat environment.   The replay capability will include the graphic portrayal of exercise maneuvers supplemented with data summaries and analyses which indicate the impact of the commander's tactical decisions and utilization of available resources in accomplishing the unit's combat mission.   In executing the replay, the system should be able to advance or return to any particular time in the exercise. The replay requirement for simultaneous exercises will be to have the ability to replay one exercise at a time.

(6)   TWSEAS post-exercise applications will include detailed statistical reports on the performance of units and systems during the exercise. The system will require a report generating capability for this purpose, with associated mathematical and statistical analysis routines and data handling facilities. Selected data analyses will be generated on-line during exercise play as well as for post-exercise applications.

(7)   The software should be capable of "graceful" degradation in the event of overload or other problem.   That is, the loss of any peripheral system, (e.g. A/N, geographic) shall not cause a system stop.

(8)   The functional areas discussed below will be incorporated to an extent no less comprehensive than accomplished in the current TWSEAS MMC and FMC applications programs.

(a)   Amphibious Operations - to include those activities in the AOA, pre-assault operations, the ship-to-shore movement and beach preparations.   The system must be capable of closely simulating all aspects of amphibious operations of concern to the landing force.   This requirement extends to pre-D-Day intelligence and fire support activities as well as operations during the conduct of the assault itself.   Landing force and OPFOR air operations and ground combat operations will be simulated.   CS and CSS activities which relate directly to the conduct of combat operations will also be portrayed.

(b)   Ground Combat - to include close combat (i.e. direct fire) simulations, movement to contact, formations, offensive/defensive operations, threat evaluation and mission transition.   The latter two and some portions of the others shall be software selectable to the automatic (with override) or the manual mode of operation, by unit.

(c)   Movement - to include cross-country and road movements, route definitions and effects of terrain and local weather.

(d)   Barrier Operations - to include natural and man-made barriers

8

(including contaminated areas) on the dry ground and underwater.

(e) <u>Intelligence</u> - to include simulations of real world systems at the collateral level, with the emphasis on tactical vice national assets, and the simulation of visual and aerial detections. Reported information will be at varying levels of detail, from precise to general, with precise for TEC use and general based on the quality of the detection.

(f) <u>Casualty Damage Assessments</u> - due to direct and indirect fire weapons. Assessment capabilities will be for all weapons, including small arms, available to landing force and aggressor units. Computations will provide for suppression (neutralization) effects as well as attrition of personnel and equipment. Assessment programs will include capabilities to evaluate the impact on ground and aviation units of any highly specialized technology such as electronic warfare. Assessments will be applied automatically to simulated units and recommended to umpires of actual units.

(g) <u>Communications/Electronic Warfare</u> - to include communications failure predictions based on radio line of sight, range and equipment failure (combat and non-combat related). Additionally, frequency confliction and effects of ECM and ECCM shall be included.

(h) <u>Combat Service Support</u> - to include water, rations, ammunition, equipment (failure/damage/repair), POL, and the phasing ashore of logistic elements and material.

(i) <u>Indirect Fire Support</u> - to include mortars, artillery, naval gunfire and MRLs.

(j) <u>Air Operations</u> - to include the functions of Marine aviation.

(k) <u>Automated Geographic Display</u> - to include the display of map informaton (picture and graphic), unit information, barriers, designated routes, exercise time, real time, and user produced graphic overlays, in a real time, automatic update mode.

(l) The software combat functions should support the ability of participants to exercise combat power in a combined arms environment to include the integration of supporting arms (including air power), ground combat, combat sevice support, special operations (i.e., EW), and surface and air mobility on a flexible, fast-moving battlefield against realistic opposing forces employing current opposing force strategy, doctrine, tactics and procedures.

(m) <u>Man-Machine Interface</u> - to include user friendly I/0 conventions and helps, appropriate informative error diagnostics and rapid response.

(n) <u>System External Interface</u> - to include input/output of data from/to various MTACCS systems (selected on a case by case basis) via high speed digital communications hardware. Additionally, TWSEAS message/command formats should be easily modifiable in order to conform to future MTACCS messages.

(o) <u>Data Base Management/Initialization</u>. The system must maintain a large, flexible, data base with both fixed and variable data on the characteristics of landing force and OPFOR organizations and equipment, weapons effectiveness, scenario events, and associated information that can be used in designing tactical exercises. The

computer simulation will use three-dimensional, digitized models to represent the terrain. The data base must be in a format and file structure that will permit ready adaptation to the requirements of a particular exercise or category of exercises. Initialization of exercise units should be based on current or projected T/Os and T/Es of the opposing forces, with alterations permitted as the situation dictates.

(p) <u>Report Generation</u> - to include solicited and unsolicited reports, statistical summaries and indicies of performance.

(q) <u>Position Conversion</u> - to provide an on call capability to convert position information to/from lat-long, UTM grids and range/bearings to navigation aids (TACAN).

c. <u>Related Software Characteristics</u>

(1) TWSEAS software must be capable of variable levels of precision in order that it may be tailored to the requirements of a particular application. It must be capable of presenting the overall exercise situation at a level of detail appropriate for the size of the particular exercise. In addition, it will be required to present the situation as it pertains to specified functional areas, focusing on those details relevant to the functional area concerned.

(2) Input/output formats will parallel conventional, standard Marine Corps terminology and symbology as required to ensure ready understanding and ease of use by controllers and other system users. These formats, however, must be easily adaptable to emerging MTACCS messages.

(3) The system should function in all applications so as to free controllers from the burdens of detailed recordkeeping and computations in order that they may concentrate on the qualitative aspects of their overall task of maintaining logical and consistent information flow within the simulated combat environment of the exercise. The TECG controllers must accomplish senior level monitoring and evaluation of the progress of exercise play toward stated exercise objectives.

(4) Various software functions/routines shall be either automatic or "on command". The choice should be selectable. For example, the simulation of air-to-air interactions may range from almost fully software controlled when no air staff is involved to more player controlled when such a staff is present.

(5) <u>Multiple Exercise Capabilities</u>

(a) As initially configured, a TWSEAS was essentially capable of supporting one tactical exercise at a time, either a map maneuver or a field maneuver. In order to provide full support for FMF and MCDEC exercise programs, software will be designed to allow future expansion into capabilities for supporting four independent exercises at the same time. Each exercise will be an independent user of system resources.

(b) Employment of the system in these multiple exercise modes will require additional terminals and additional controllers as compared to the normal single exercise mode. The extent of these additions will be determined in the development of detailed system specifications to implement this requirement.

d. <u>Hardware Characteristics</u>

(1) The hardware suite for the upgraded software will be essentially the same as currently fielded with selected upgrades to various pieces of equipment.

(2) In order to effect the interfaces between PLRS, the DCT and TWSEAS, an interface controller will probably be required. Design and selection of this item shall be influenced by the employment criteria associated with field use.

(3) Remote Operations. As initially configured, TWSEAS was capable of processing and displaying exercise data in only one central location, the TECG. This initial capability may be extended in future configurations to permit the following types of operations:

(a) Display of selected alphanumeric and geographic data at senior echelons of the landing force.

(b) Specialized, limited, on-site processing at remote locations to support exercises that will not require the full system capability or to support extended, decentralized operations in large scale maneuvers.

(4) Other hardware aspects remain the same as currently fielded.

e. Reliability, Availability, and Maintainability

(1) A TWSEAS must be designed for frequent, high intensity use. It will be employed repeatedly in tactical exercises throughout the year and must be operational for all scheduled exercises. Maintenance and support concepts must be tailored to sustain high operational availability and achieve maximum readiness for exercise commitments. Four weeks will be reserved annually for scheduled hardware maintenance, to be accomplished in short periods between exercise commitments. The enhancement provided to the TWSEAS, as a result of the Product Improvement Plan, will have no adverse impact on the maintenance and support concepts as presently established for the existing system.

(2) The system will be subject to intensive use during tactical exercises. Duration of exercise play may range from 4 hours to 10 days to include 24 hours around-the-clock operations for the full length of the exercise. For an average mission duration of 72 hours, an MTBF (mean-time-between-failures) of 1400 hours is required to provide a 95 percent probability of mission success. System failures and malfunctions must be identified, isolated and corrected at the organizational level with an MTTR (mean-time-to-repair) of 30 minutes. The MAXCT (maximum corrective time) for the 95th percentile of all maintenance actions shall be 90 minutes. Comprehensive diagnostic test programs must be available for testing computer and peripheral equipment for rapid identification and isolation of malfunctions to the replaceable module level. Component and installation design must provide for easy access to permit maintenance, tests, and replacement of modules. Provisions must be made for continuing operations in degraded modes so as to minimize their adverse impact on system availability during the exercise.

(3) TWSEAS software will be of modular design to facilitate tailoring of the computer programs for different system applications and to promote a singular software maintenance effort. Different portions of the software package should not demand unique skills or facilities requiring separate dedicated efforts for their maintenance. Provisions must be included to prevent loss of memory and stored information, incorrect computation, and equipment damage in the event of power system malfunction.

11

f. Additional Characteristics

(1) TWSEAS will process collateral classified information as required to accomplish its exercise support missions. Classified materials will be handled in accordance with applicable regulations. The TWSEAS Systems must be tempest certified.

(2) TWSEAS must be capable of operating from either commercial electrical power sources or from standard Marine Corps generators.

g. Nuclear hardening is not required.

h. TWSEAS software design and documentation will be in accordance with that prescribed by Mil-Std-1644B (modified), or DoD-Std-1679A (modified).

5. INTRA/INTEROPERABILITY AND STANDARDIZATION REQUIREMENTS

a. TWSEAS is not required to automatically interoperate with any system exterior to the Marine Corps. A manual interface with a Navy wargame system has been demonstrated in the past and may become a future requirement.

b. TWSEAS is required to intraoperate with the DCT and the Marine MTACCS family as they emerge. Some of the interfaces are clearly required to be automatic. PLRS, DCT and MIFASS are prime examples. Others should be assessed in terms of functional requirements, cost and technical risk. Interface to the Artillery Computer System will be a requirement when that system is more completely defined.

c. TWSEAS IMC design will implement the Marine Corps message standard for MTACCS. It will be an exercise C^2 system in the MTACCS era and will assist the commander and his staff in utilizing, as opposed to just operating, these systems.

6. RELATED EFFORTS

a. United States Army

(1) Army Training Battle Simulation System (ARTBASS) - A mobile simulation system similar to the TWSEAS. A network of nine systems is planned.

(2) Computer Assisted Map Maneuver Simulation (CAMMS)

b. United States Navy

(1) The Naval War Gaming System (NWGS) - A computer based system designed to support the study of the strategic use of sea power by students at the Naval War College.

(2) Naval Tactical Game (NAVTAG) - Microprocessor based computer-assisted naval weapons and tactics simulation.

7. TECHNICAL FEASIBILITY, ENERGY EFFECTIVENESS IMPACT, AND COST FORECAST

a. The technical feasibility of achieving this requirement has been established

12

through prior Marine Corps development projects: the Tactical Wafare Analysis and Evaluation System (TWAES) and the Tactical Exercise Simulator and Evaluator (TESE). The assets of these two efforts have been consolidated into TWSEAS in order to provide a baseline for further development which will provide multiple, integrated capabilities for controlling and evaluating tactical exercises within a network of operational systems.

b. The technical problems to be solved are anticipated to be chiefly in the following areas:

(1) The development of a common system software and data base that can support the projected range and diversity of system applications.

(2) The development of flexible, integrated applications software with a core of common modules that can be economically and effectively integrated with the necessary unique routines to design a computer program for a specific application.

(3) The development of combat-simulation models which cover all required functional areas of combat and which can be selectively applied to support staff exercises and appropriate portions of troop exercises.

(4) The development of performance standards and indices and the associated identification of observable, measurable characteristics of individual, unit, and system performance in accomplishing assigned combat missions and functions.

(5) The development of an improved methodology for combat power evaluation, casualty and damage assessments.

(6) Selection of equipment, design of user interfaces, and provision of communications support which will allow a small group of controllers to manage the information flow in tactical exercises necessary to create and control a dynamic, realistic, simulated combat environment.

c. Solutions to these problems will be complicated by the fundamental requirement to achieve flexibility and diversity in TWSEAS applications. The adaptation or development of a real-time operating system and a supporting data base for IMC is essential to support the projected range and diversity of the simulations. It is anticipated that computer assistance can be provided primarily by state-of-the-art equipment and programming techniques.

d. The energy effectiveness impact of this development lies primarily in the electrical power requirements for supporting the systems. These requirements should not materially add to power consumption for normal operations at major Marine Corps bases. There is no other known energy effectiveness impact.

e. The cost forecast for TWSEAS is as follows (1984 constant dollars):

(1) Costs. The RDT&E and PMC cost forecasts in thousands of dollars are as follows:

	FY 84	FY 85	FY 86	FY 87	FY 88
RDT&E	1375	2810	2155	1740	490
PMC*	249	203	360	360	-
O&M*	1014	1080	1080	1080	1235

13

(2)　Operations and Maintenance (O&M, MC) Costs. The TWSEAS O&M, MC cost forecast includes organizational, intermediate and depot level maintenance and exercise employments.

8.　MANPOWER AND TRAINING REQUIREMENTS. There are two organizations which support or utilize the TWSEAS system. These are the TWSEAS Network and the several TACEX teams.

a.　TWSEAS Network. This organization is responsible for logistical, hardware, and software support at the depot level. It consists of personnel from varied fields, both civilian and military. The Network utilizes the MCDEC TWSEAS hardware as a software support activity. It exercises configuration management of the TWSEAS systems and provides training for TACEX team members. The current TWSEAS Network T/O is attached as enclosure (1).

b.　TWSEAS TACEX Teams. These teams form the basis of the TECG in all TWSEAS supported exercises. They differ in T/O between the FMF and MCDEC. With the increase in required system functional operations, some increase in the current T/O is required. Additionally, current system use is limited by the support team size. Training for TACEX Team members is the responsibility of the TWSEAS Network and will consist of formal classes and OJT. Basic training resources required are the TWSEAS system operator/user manuals and TAD funds. Instructors will be obtained from TWSEAS teams, the Network and the PDA. A proposed T/O is attached as enclosure (2).

* These costs are projected for currently planned equipment upgrades and normal operations and are not directly influenced by the software PIP identified in this ROC.

14

Proposed FMF TACEX Team
T/O

Billet	Rank	MOS
Employment Officer	LtCol	9910
Operations Officer	Maj	75XX
Supporting Arms Officer	Capt	0802
Logistics Officer	Lt/Capt	0402
Ground Combat Officer	Capt/Maj	0302
Intell Officer	Capt	0202
Intell Controller	Lt	0202
Communications Chief (NCOIC)	Gy/MSgt	2591/2691
Supply NCO	Cpl/Sgt	3043
Communications Man	LCpl/Pfc	2531
Console Operators (8)	Pfc/Cpl	0151
Systems Engineer	Civilian	
Systems Programmer	Civilian	
Systems Technician	Civilian	
Admin Clerk	Civilian	

NOTE: The above T/O would allow for a port and starboard team concept and would decrease the reliance on outside agencies for exercise support.

TWSEAS Network and MCDEC TACEX Team
T/O

Billet	Rank	MOS
TWSEAS Network Staff		
TWSEAS Ntwk Cmdr	LtCol	9910
Clerk Typist	GS-4	
Configuration Mgr	Maj	9640
ILS Officer	Capt	3002
Supply NCO	Sgt	3043
Tech Librarian	GS-7	
Ntwk Eng	GS-11	
Ntwk Programmer (3)	GS-9	
Computer Support Officer	Maj	9910
Tech Analyst	Capt	9910
OPS Analyst	Capt	9910
MCDEC TACEX TEAM		
Team Cmdr	Maj	0302/0802
TWSEAS Support Officer	Capt	75XX
Intel Officer	Capt	0202
Simulations Sup Officer	Lt	4002
Computer Opr	Sgt	4034
Team Engineer	GS-9	
Team Programmer	GS-9	
Computer Tech	GS-9	
Terminal Opr (3)	GS-4	

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